

**What is claimed is:**

1. A method for synchronizing in the receiver of an orthogonal frequency division multiplexing (OFDM) wireless communication system where the OFDM transmitter inserts training symbols in transmission signals, said method comprising the steps of:

receiving a OFDM transmission;  
developing a weighted representation of the received signal  
performing frequency synchronization of the received signal using the developed weights.

2. The method of claim 1, further comprising the step of performing a course-time synchronization of the received signal prior to the step of developing a weighted representation.

3. The method of claim 2, wherein the OFDM transmission is a packetized data transmission and wherein the course-time synchronization comprises packet detection.

4. The method of claim 2, further comprising the step of performing a fine-time synchronization of the received signal prior to the step of developing a weighted representation.

5. The method of claim 2, further comprising the step of performing a fine-time synchronization of the received signal subsequent to the step of performing frequency synchronization.

6. The method of claim 1, wherein the wireless communication system is a multiple-input multiple output (MIMO) OFDM system, and wherein the step of performing frequency synchronization of the received signal is performed for the signal received through at least one receive antenna.

7. The method of claim 6, wherein the step of performing frequency synchronization of the received signal is performed for the signals received through all of the receive antennas.

8. The method of claim 1, wherein the training symbols have been modulated in an OFDM modulator of the transmitter, and wherein the performing frequency synchronization further comprises the step of performing fast Fourier transform (FFT) filtering.

9. The method of claim 8, wherein the performing frequency synchronization further comprises the step of recomposing the received signal using an inverse fast Fourier transform (IFFT) subsequent to FFT filtering.

10. An apparatus for the synchronization of wireless transmissions received from an OFDM transmitter, said apparatus comprising:

at least one antenna for receiving the OFDM transmission signal;

a frequency synchronization module couple to the at least one antenna for developing a weighted representation of the received signal;

a frequency offset compensation module for performing frequency offset compensation on the received signal using the weighted representation developed by the frequency synchronization module.

11. The apparatus of claim 10, wherein the at least one antenna comprises a plurality of antennas, and further comprising a plurality of frequency synchronization modules, each frequency synchronization module coupled to one of the plurality of antennas.

12. The apparatus of claim 10, wherein the OFDM transmission includes data in packet form and further comprising a packet detector coupled to the at least one antenna and to the frequency synchronization module.

13. The apparatus of claim 10, wherein the frequency synchronization module comprises a fine-time synchronization module for performing fine-time synchronization on the received signal prior to the developing of a weighted representation of the received signal.

14. The apparatus of claim 10, further comprising a fine-time synchronization module coupled to the frequency synchronization module for performing fine-time synchronization on the frequency synchronized module.

15. The apparatus of claim 10, wherein the a frequency synchronization module couple further comprises an FFT filter for applying an FFT to the received signal prior to developing the weighted representation.

16. The apparatus of claim 15, wherein the a frequency synchronization module couple further comprises an IFFT function for recomposing the transformed signal subsequent to developing the weighted representation.

17. The apparatus of claim 10, wherein the apparatus is included in terminal operable in a cellular telephone network.

18. The apparatus of claim 10, wherein the apparatus is included in terminal operable in a wireless local area network (WLAN).